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MODEL USB-DIO-96
USB 96 CHANNEL
DIGITAL INPUT/OUTPUT MODULE
USER MANUAL

FILE: MUSB-DIO-96.B2

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Chapter 1: Introduction

Features

- 96 lines of digital I/O
- High-speed USB 2.0 device, USB 1.1 backwards compatible
- High-retention USB type B connector for a solid communication connection
- Twelve (12) 8-bit ports independently selectable for inputs or outputs
- All I/O lines buffered with 32 mA source, 64mA sink current capabilities
- I/O buffers can be enabled or tri-stated under program control
- Drivers and sample application provided
- Jumper selectable I/O pulled up to 5V (via 10KΩ), pulled down to ground or floating
- Jumper selectable power provided via USB cable or external power supply for higher current sourcing capabilities
- Resettable fused +5VDC output per I/O connector
- Standard 50-pin IDC-type shrouded connectors with key
- PC/104 size board (3.550 by 3.775 in.)
- Rugged industrial enclosure
- Compatible with Industry-Standard I/O Racks such as Gordos, OPTO22, Potter & Brumfield, etc.

Applications

- Automatic Test Systems
- Laboratory Automation
- Robotics
- Machine Control
- Security Systems, Energy Management
- Relay Monitoring and Control
- Parallel Data Transfer to PC
- Sensing Switch Closures or TTL, DTL, CMOS Logic
- Driving Indicator Lights or Recorders

Functional Description

This USB board is an ideal solution for adding portable, easy-to-install digital I/O capabilities to any computer with a USB port. The board is a USB 2.0 high speed device, offering the fastest speed available with the USB bus. It is fully compatible with both USB 1.1 and USB 2.0 ports. The card is plug-and-play allowing quick connect/disconnect whenever you need additional I/O on your USB port.

The board features 96 lines of TTL-compatible digital I/O with high-current capabilities. Each digital port can be programmed to accept inputs or to drive outputs in 12 groups of 8-bit ports. The I/O wiring connections are via four industry standard 50-pin connectors. For external circuits, fused +5VDC power is available at the each connector. The two resettable fuses are rated at 0.5A, with each fuse feeding two I/O connectors.

All I/O lines are buffered by a type 74ABT543A tristate buffer transceiver capable of sourcing 32 mA or sinking 64 mA. The buffers are configured under program control for input or output.

I/O Lines are jumper selectable with pull-ups (to +5 VDC via 10KΩ) or with pull-downs (to ground).

Unlike most USB digital I/O products which primarily use a human interface device (HID) driver, we provide an easy to use, Windows-based, custom function driver optimized for maximum data throughput. This approach exposes the full functionality of the hardware along with maximizing the advantage of using the high-speed USB 2.0 bus.

Power is supplied to the card via the USB cable or for higher current capabilities, external power may be used. Complimenting the high-retention USB type B connector (quickly recognized by the orange insulator) is a factory option for a high-retention external power screw terminal pair.

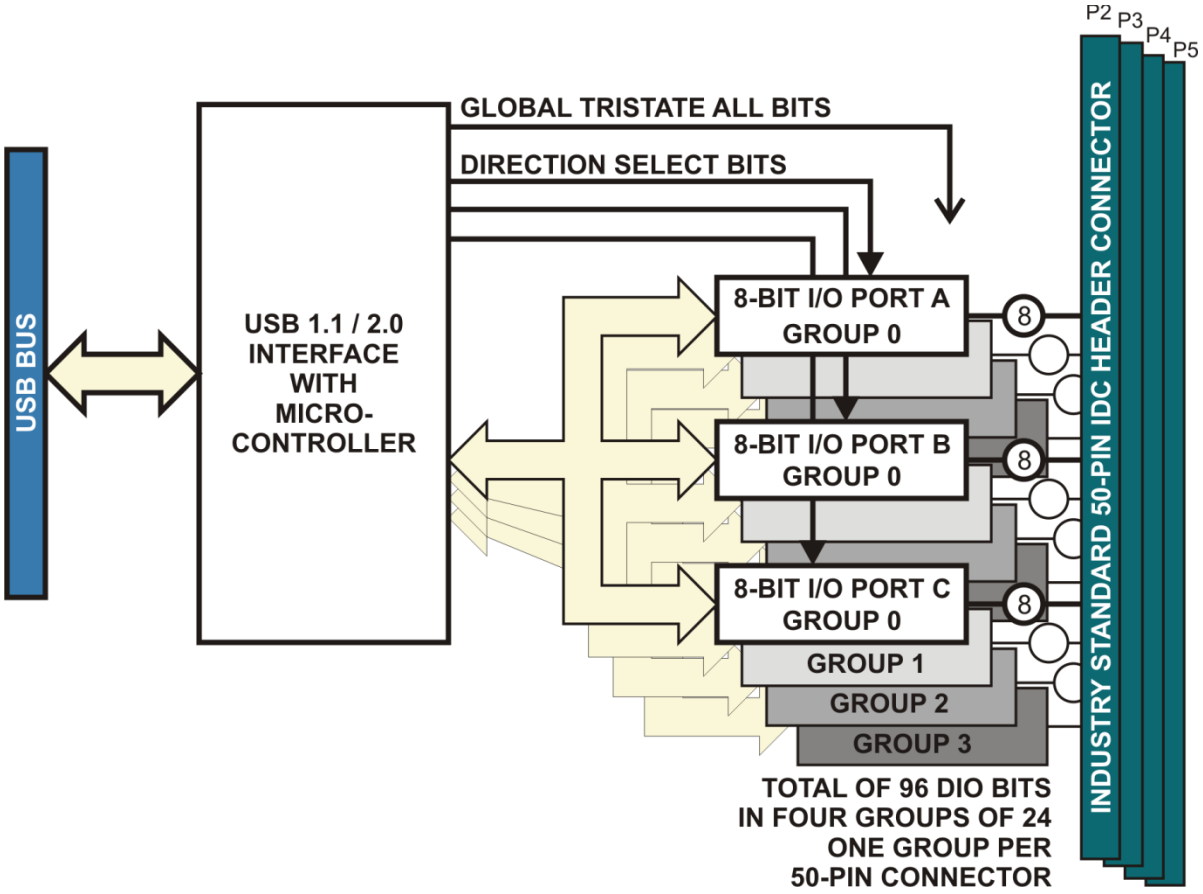


Figure 1-1: Block Diagram

Ordering Guide

USB-DIO-96	USB 96-channel digital input/output module

Model Options

- -OEM — Board only version with no enclosure
- -DIN — DIN rail mounting bracket for integrating into existing DIN rail systems
- -PR — On-board DC power circuitry and external regulated power AC/DC (5V DC) adapter
- -ST — External power components & screw terminals for regulated 5V power input (high retention) * *See Chapter 3 Hardware Details for connecting power using STB-DIO-96 optional accessory*
- -RoHS — This product is available in a RoHS compliant version. Please call for specific pricing then be sure to add this suffix to the model number on any hard-copy or verbal purchase orders.

Special Order

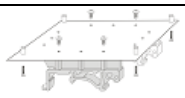
Contact factory with your special requirement. Examples of special orders would be conformal coating, latching I/O headers.

Included with your board

The following components are included with your shipment, depending on options ordered. Please take the time now to ensure that no items are damaged or missing.

- USB Module in labeled enclosure with an anti-skid bottom
- 6' USB 2.0 cable
- Software Master CD
- USB I/O Quick-Start Guide

Optional Accessories

• STB-DIO-96	Direct connect 108-pin spring-cage terminal board, mounts on top of USB-DIO-96 inside the enclosure. *Screw Terminals can be used to connect +5VDC External Power	
• CUSB-EMB-X	USB Type A to micro-fit OEM header, X=1 for 1’ cable, 6 for 6’ cable	
• CAB50F-6	Six-foot ribbon cable assembly with 50-pin female connectors	
• STB-50	Screw terminal board, typically ships with standoffs but can also mount on SNAP-TRACK or DIN-SNAP	
• DIN-SNAP-6	Six inch length of SNAP-TRACK with two clips, for mounting one STB-50 screw terminal board on a DIN rail	
• STB-96CH	50-Pin Multi-Header Universal Screw Terminal Board with steel powder coated enclosure for up to 96 Digital I/O Channels	
• IIB-24	24-Channel Optically Isolated Input Board	
• ROB-24	24-Channel Electromechanical Relay Board	
• MP104-DIN	DIN-rail mounting adapter plate for affixing any USB/104 module to a DIN-rail	

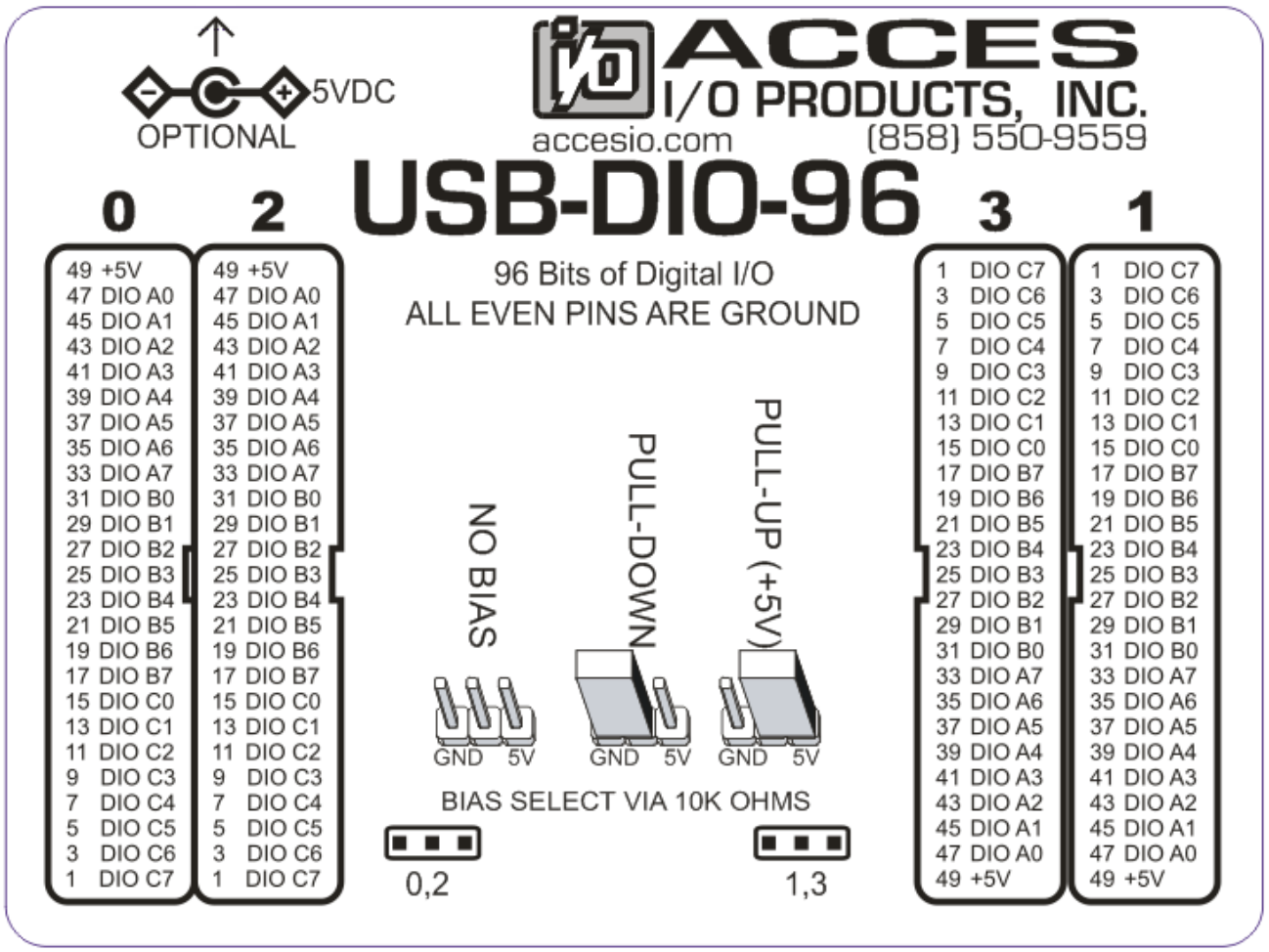


Figure 1-2: Enclosure Label

Chapter 2: Installation

Software CD Installation

The software provided with this board is contained on one CD and must be installed onto your hard disk prior to use. To do this, perform the following steps as appropriate for your software format and operating system. Substitute the appropriate drive letter for your CD-ROM or disk drive where you see D: in the examples below.

WIN NT/2000/XP/2003

a. Place the CD into your CD-ROM drive.
b. The install program should automatically run. If it does not click START | RUN and type D:\INSTALL, click OK or press Enter.
c. Follow the on-screen prompts to install the software for this board.

Hardware Installation

The board can be installed in any USB 2.0 or USB 1.1 port. Please refer to the USB I/O Quick Start Guide which can be found on the CD, for specific, quick steps to complete the hardware and software installation.

Chapter 3: Hardware Details

Refer to the setup programs on the CD provided with the board. Also, refer to the Block Diagram and the Option Selection Map when reading this section of the manual.

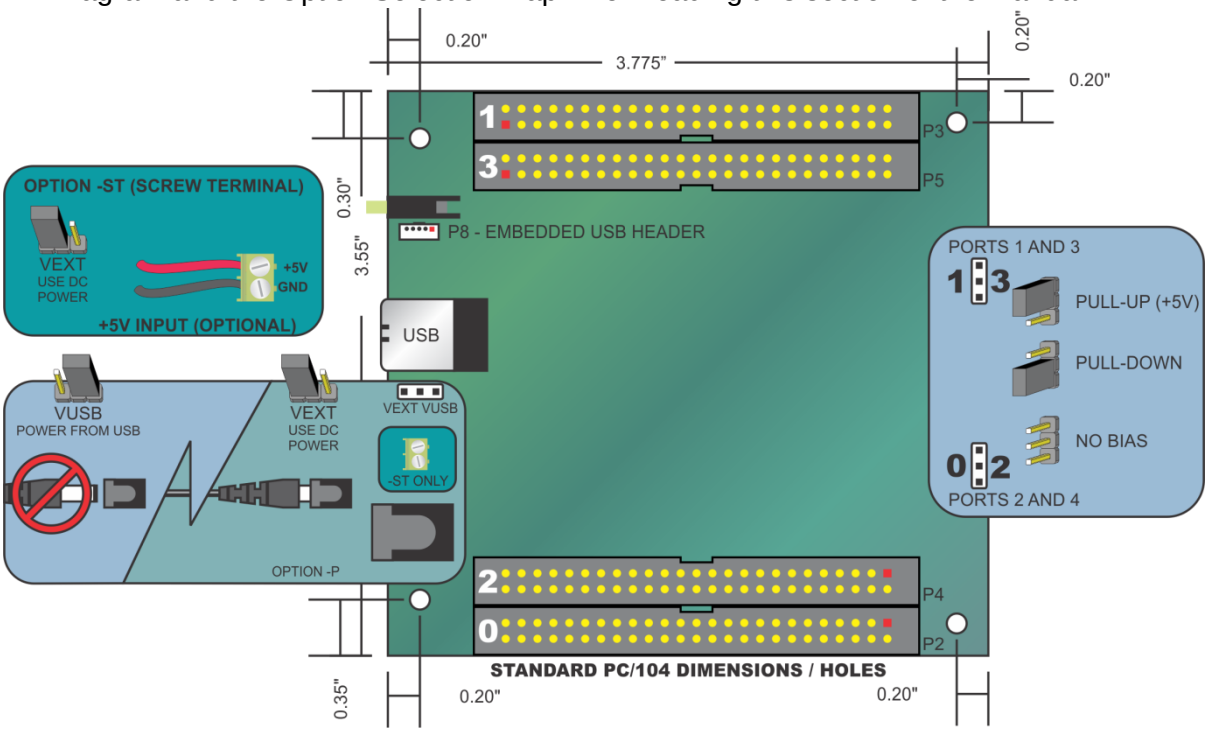


Figure 3-1: 96 Channel Board Option Selection Map

USB Connector

The USB connector is a Type B high-retention type connector and mates with the cable provided. The USB port provides communication signals along with +5 VDC power.

Embedded USB Connector

Micro 5-pin header provides embedded devices with a compact USB interface.

LED

The LED on the front of the enclosure is used to indicate power and data transmissions. When the LED is in an illuminated steady green state, this signifies that the board is successfully connected to the computer and has been detected and configured by the operating system. A continuously flashing LED signifies transmitted data over the USB.

DC Power Jack (Optional)

For high current applications when current sourced on outputs is anticipated to output more than a USB port can provide (typically 500 mA). The DC jack has a 2.00mm post and is designed to be used with the AC/DC regulated 5V external power supply shipped with this option. To configure for use, switch the jumper located near the USB connector to VEXT (please consult the option selection map for a visual reference).

-ST Screw Terminals for High Retention Ext. Power

Specify “-ST” when ordering the OEM version of this board to connect external power via secure screw terminals instead of a non-retained DC jack. Strip your wires approximately 4mm and tin, then tighten the regulated +5 VDC source leads into the labeled terminals.

STB-DIO-96 Terminal Board for High Retention Ext. Power

When using our convenient breakout accessory with the USB-DIO-96, you can connect your regulated 5VDC external power to one or both pairs of screw terminals on the STB-DIO-96 to power up the board, instead of specifying the “-ST” factory option. Remove the VUSB / VEXT jumper (or hook it onto only one of the posts as a jumper keeper for later use).

50 Pin Box Headers

The 50 pin box headers have standard 0.100" spacing between pins and are keyed to prevent improper connections. It can be used with standard IDC type ribbon cables.

5V Resettable Fused Outputs

Two 0.5A resettable fuses each feed two I/O connectors at pin 49 used to power external module racks or relay boards and such. If an over-current persists on a circuit protected by a resettable fuse, it will open interrupting power to the circuit. Response time depends on over-current level and ambient temperature, humidity, etc. The fuse will remain open until the bi-metal elements cool sufficiently, at which time the circuit will be restored.

Pull-Up / Pull-Down Configuration Jumpers

One configuration jumper controls two connector groups (0 & 2, and 1 & 3) can be pulled up to +5V via 10KΩ (for dry-contact monitoring) or pulled down (for positive control logic applications). When no jumpers are installed, the lines are left floating, however due to the 10K resistor packs any un-used input will not have suppressed cross-talk. For pull-ups (most common), install these jumpers in the +5V position. For pull-downs, install these jumpers in the GND position. For neither, remove these jumpers.

-OEM's, Laying Out Your Own Mating Board

OEM customers will greatly benefit from creating their own interface board layout with application specific circuitry and connectors as part of a complete system. This section is intended to assist the board designer in that task by providing detailed dimensional drawings and mating connector part number details needed when placing mating connectors on the interface board layout.

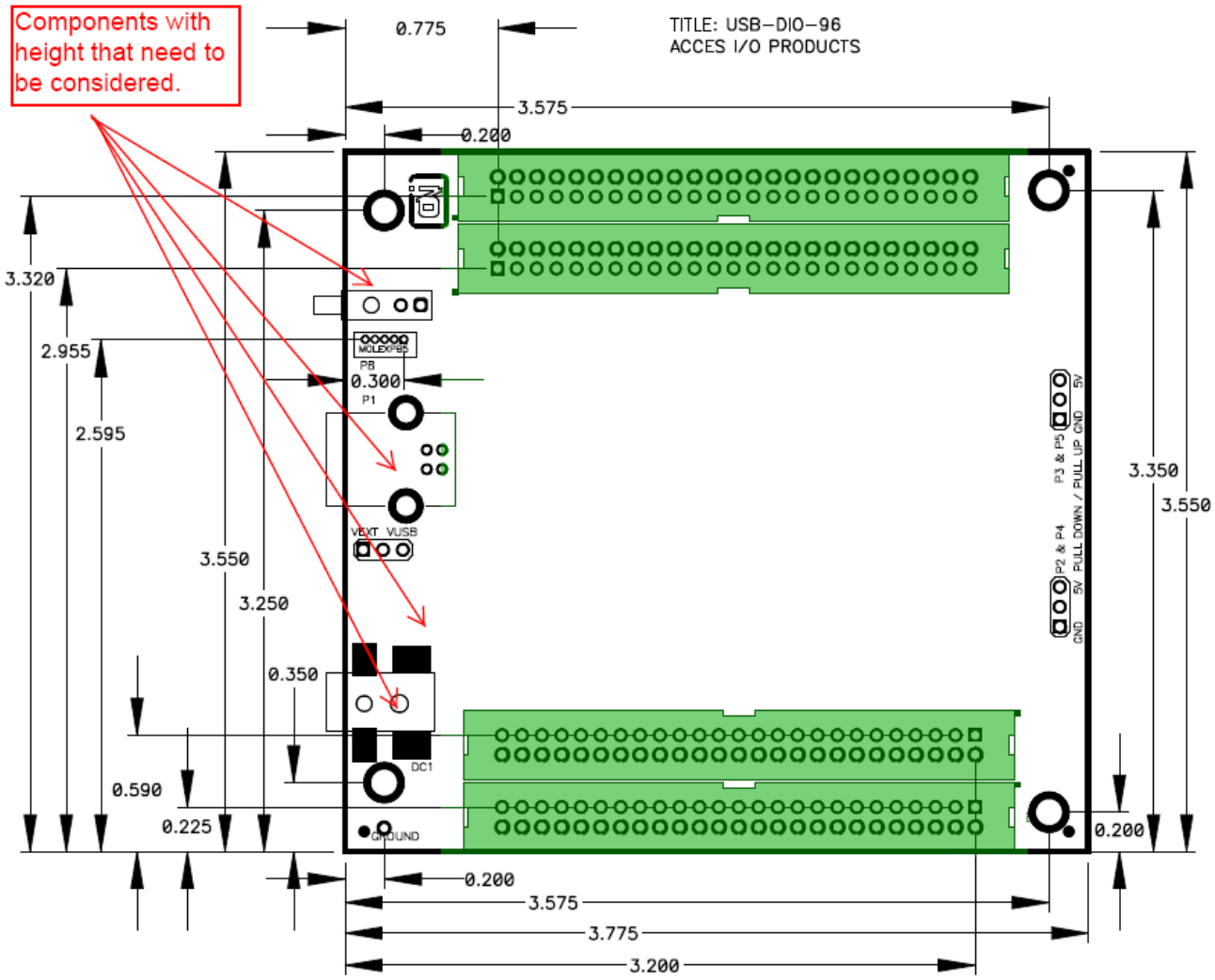


Figure 3-2: 96 Channel Board Full Dimensions

Female Mating Connectors

Four 50 pin female mating connectors would be part of an interface board layout. Examples of manufacturer part numbers of these connectors would be:

ADAMTECH RSB-50-G

Central Components ARS-02-P-50-GD

Chapter 4: USB Address Information

Use the provided driver to access the USB board. This driver will allow you to determine how many supported USB devices are currently installed, and each device's type. This information is returned as a Vendor ID (VID), Product ID (PID) and Device Index.

The VID is "0x1605" while the 96 bit board PID is "0x8003".

The Device Index is determined by how many of the devices you have in your system, and provides a unique identifier allowing you to access a specific board.

Chapter 5: Programming

The driver software provided with the board uses a 32-bit .dll front end compatible with any Windows programming language. Samples provided in Borland C++Builder, Borland Delphi, Microsoft Visual Basic, and Microsoft Visual C++ demonstrate the use of the driver.

The following is a list of the most common function calls provided by the driver in Windows.

For a complete list of available functions and details on how to use them refer to the USB Software Reference Manual located in the installation path for this board.

unsigned long DIO_Configure(DeviceIndex, bTristate, pOutMask, pData)

unsigned long **DIO_Configure**(
unsigned long DeviceIndex - number from 0-31 of the device you want to configure
unsigned char bTristate - boolean value. TRUE causes all bits on the device to enter tristate (high-impedance) mode. FALSE removes the tristate. The tristate is changed **after** the remainder of the configuration has occurred. All devices with this feature power-on in the "tristate" mode at this time.
void *pOutMask - a pointer to the first element of an array of bytes; one byte per 8 ports or fraction. Each "1" bit in the array indicates that the corresponding byte of the device is Output.
void *pData - a pointer to the first element of an array of bytes. Each byte is copied to the digital output ports on the device before the ports are taken out of tristate. Any bytes in the array associated with ports configured as input are ignored.
)

The size of the out mask and data is as follows:

Out Mask	2 bytes
Data	12 bytes

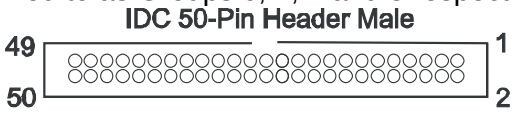
unsigned long DIO_WriteAll(DeviceIndex,pData)
unsigned long DIO_ReadAll(DeviceIndex,pData)

unsigned long DeviceIndex - number from 0-31 of the device you wish to write/read all output bits on
void *pData - pointer to the first element of an array of bytes. DIO_WriteAll copies each byte to the corresponding output port; bytes written to ports configured as inputs are ignored. DIO_ReadAll reads each port, and the reading stored in the corresponding byte in the array.
)
Note that the size of "all" is the same as the size of the data given under DIO_Configure.

Byte Index	0	1	2	3	4	5	6	7	8	9	10	11
Hardware Port	0A	0B	0C	1A	1B	1C	2A	2B	2C	3A	3B	3C
Bits	0-7	8-15	16-23	24-31	32-39	40-47	48-55	56-63	64-71	72-79	80-87	88-95

Chapter 6: Connector Pin Assignments

Four 50-pin male headers are provided for I/O connections designated as P2, P3, P4 and P5, which are also referred to as Groups 0, 1, 2 and 3 respectively.



PIN	P2	P3	P4	P5	PIN	FUNCTION
1	I/O 23	I/O 47	I/O 71	I/O 95	2	GROUND
3	I/O 22	I/O 46	I/O 70	I/O 94	4	GROUND
5	I/O 21	I/O 45	I/O 69	I/O 93	6	GROUND
7	I/O 20	I/O 44	I/O 68	I/O 92	8	GROUND
9	I/O 19	I/O 43	I/O 67	I/O 91	10	GROUND
11	I/O 18	I/O 42	I/O 66	I/O 90	12	GROUND
13	I/O 17	I/O 41	I/O 65	I/O 89	14	GROUND
15	I/O 16	I/O 40	I/O 64	I/O 88	16	GROUND
17	I/O 15	I/O 39	I/O 63	I/O 87	18	GROUND
19	I/O 14	I/O 38	I/O 62	I/O 86	20	GROUND
21	I/O 13	I/O 37	I/O 61	I/O 85	22	GROUND
23	I/O 12	I/O 36	I/O 60	I/O 84	24	GROUND
25	I/O 11	I/O 35	I/O 59	I/O 83	26	GROUND
27	I/O 10	I/O 34	I/O 58	I/O 82	28	GROUND
29	I/O 09	I/O 33	I/O 57	I/O 81	30	GROUND
31	I/O 08	I/O 32	I/O 56	I/O 80	32	GROUND
33	I/O 07	I/O 31	I/O 55	I/O 79	34	GROUND
35	I/O 06	I/O 30	I/O 54	I/O 78	36	GROUND
37	I/O 05	I/O 29	I/O 53	I/O 77	38	GROUND
39	I/O 04	I/O 28	I/O 52	I/O 76	40	GROUND
41	I/O 03	I/O 27	I/O 51	I/O 75	42	GROUND
43	I/O 02	I/O 26	I/O 50	I/O 74	44	GROUND
45	I/O 01	I/O 25	I/O 49	I/O 73	46	GROUND
47	I/O 00	I/O 24	I/O 48	I/O 72	48	GROUND
49	+5VDC	+5VDC	+5VDC	+5VDC	50	GROUND

Table 6-1: 50-Pin Connector Pin Assignments

Chapter 7: Specifications

Digital Inputs (TTL Compatible)

- Logic High: 2.0 VDC min, 5.5 VDC max
- Logic Low: 0.8 VDC max, -0.5 VDC min
- Bias Resistors: 10K Ω

Digital Outputs

- Logic High: 2.0 VDC min., source 32 mA
- Logic Low: 0.55 VDC max., sink 64 mA

Bus Type

- USB2.0 high-speed (480 Mb/s)

Power

- Basic 96 bit unit: 318 mA typical (no load)
- +5 VDC from the USB bus or external power supply depending on user configuration. The USB bus is specified to provide 500 mA to most desktop environments. This gives you 182 mA available (500 mA - 318mA = 182 mA). If using more than a total of 500mA, use optional regulated 5 VDC external power supply and **remove** VUSB jumper and place jumper on VEXT. Then plug in external power before plugging into USB port .
- +5V resettable fuse at 0.5A feeds two I/O connectors each

Environmental

- Operating Temp.: 0 °C. to 70 °C.
- Storage Temp.: -40 °C. to +85 °C.
- Humidity: 5 to 95% RH, non-condensing.
- Board Dimension: 3.550 x 3.775 inches.
- Box Dimension: 4.00 x 4.00" x 1.25 inches.

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: ***manuals@accesio.com***. Please detail any errors you find, we will reply with manual updates

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